

WHAT IS CLAIMED IS:

1. An isolated nucleic acid encoding a polypeptide comprising a subunit of a cation channel, the polypeptide:

(i) forming, with at least one CNG alpha subunit, a cation channel having the characteristic of cyclic nucleotide-gating; and

(ii) comprising an amino acid sequence having at least 95% sequence identity to SEQ ID NO:1.

2. The nucleic acid of claim 1, wherein the nucleic acid encodes a polypeptide comprising an amino acid sequence of SEQ ID NO:1.

3. The nucleic acid of claim 1, wherein the nucleic acid comprises a nucleotide sequence having at least 90% sequence identity to SEQ ID NO:2 or SEQ ID NO:3.

4. The nucleic acid of claim 3, wherein the nucleic acid comprises a nucleotide sequence of SEQ ID NO:2 or SEQ ID NO:3.

5. The nucleic acid of claim 1, wherein the nucleic acid is amplified by primers that selectively hybridize under stringent hybridization conditions to the same sequence as the primers selected from the group consisting of:

GCAGATCTTTCAGAACTGTGAGGCCA (SEQ ID NO:4)

CCTGCCCTCTTCATCTTTGGAAGTTC (SEQ ID NO:5)

GCCAACATCAAGAGCCTAGGTTATTC (SEQ ID NO:6)

GGATGATCTACAGACCAAGTTTGCTCG (SEQ ID NO:7)

ATGAGCCAGGACACCAAAGTGAAGAC (SEQ ID NO:8)

GTTGATGATGCTGATCTCCCCAAAG (SEQ ID NO:9)

GGATGATGAGGTTATACATGACTGGG (SEQ ID NO:10)

AGGCTAGCAACTTCCTGCGCCTTGGAT (SEQ ID NO:11)

GCGAAAGCTTCCACCATGAGCCAGGACACCAAAGTG (SEQ ID

✓NO:12) and

CATGTCTAGAATGGGGATGGGGTCACTCTGGACCT (SEQ ID

NO:13).

1 6. The nucleic acid of claim 1, wherein the nucleic acid selectively
2 hybridizes under moderately stringent hybridization conditions to a nucleic acid
3 comprising a nucleotide sequence of SEQ ID NO:2 or SEQ ID NO:3.

1 7. An isolated nucleic acid encoding a CNG2B polypeptide, the
2 nucleic acid specifically hybridizing under stringent conditions to a nucleic acid
3 comprising a nucleotide sequence of SEQ ID NO:2 or SEQ ID NO:3.

1 8. An isolated nucleic acid encoding a CNG2B polypeptide, the
2 nucleic acid comprising a nucleotide sequence having at least 90% sequence identity to
3 SEQ ID NO:2 or SEQ ID NO:3.

1 9. An isolated nucleic acid that specifically hybridizes under stringent
2 conditions to a nucleic acid encoding an amino acid sequence of SEQ ID NO:1.

1 10. A method of detecting a nucleic acid, the method comprising
2 contacting the nucleic acid with an isolated nucleic acid of claim 1.

1 11. An isolated polypeptide comprising a subunit of a cation channel,
2 the polypeptide:

3 (i) forming, with at least one CNG alpha subunit, a cation channel
4 having the characteristic of cyclic nucleotide-gating; and

5 (ii) comprising an amino acid sequence having at least 95% amino
6 acid sequence identity to SEQ ID NO:1.

1 12. The polypeptide of claim 11, wherein the polypeptide specifically
2 binds to antibodies generated against SEQ ID NO:1.

1 13. The polypeptide of claim 11, wherein the polypeptide has a
2 molecular weight of between about 61 kD to about 71 kD.

1 14. The polypeptide of claim 11, wherein the polypeptide has an amino
2 acid sequence of human CNG2B.

1 15. The polypeptide of claim 11, wherein the polypeptide has an amino
2 acid sequence of SEQ ID NO:1.

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1 16. The polypeptide of claim 11, wherein the polypeptide comprises an
2 alpha subunit of a heteromeric cyclic nucleotide-gated cation channel.

1 17. An antibody that specifically binds to the CNG2B polypeptide of
2 claim 11.

1 18. The antibody of claim 17, wherein the polypeptide to which the
2 antibody binds has an amino acid sequence of SEQ ID NO:1.

1 19. An expression vector comprising the nucleic acid of claim 1.

1 20. A host cell transfected with the vector of claim 19.

1 21. A method for identifying a compound that increases or decreases
2 ion flux through a cation channel, the method comprising the steps of:

3 (i) contacting the compound with a CNG2B polypeptide, the polypeptide
4 (a) forming, with at least one CNG alpha subunit, a cation channel
5 having the characteristic of cyclic nucleotide-gating; and

6 (b) comprising an amino acid sequence having at least 95%
7 sequence identity to SEQ ID NO:1; and

8 (ii) determining the functional effect of the compound upon the cation
9 channel.

1 22. The method of claim 21, wherein the functional effect is measured
2 *in vitro*.

1 23. The method of claim 22, wherein the functional effect is a physical
2 effect.

1 24. The method of claim 22, wherein the functional effect is
2 determined by measuring ligand binding to the channel.

1 25. The method of claim 22, wherein the functional effect is a chemical
2 effect.

1 26. The method of claim 21, wherein the polypeptide is expressed in a
2 eukaryotic host cell or cell membrane.

1 28. The method of claim 27, wherein the functional effect is
2 determined by measuring ligand binding to the channel.

1 29. The method of claim 26, wherein the functional effect is a chemical
2 effect.

1 30. The method of claim 29, wherein the functional effect is
2 determined by measuring ion flux, changes in ion concentrations, changes in current or
3 changes in voltage.

1 31. The method of claim 21, wherein the polypeptide is recombinant.

1 32. The method of claim 21, wherein the cation channel is
2 homomultimeric.

1 33. The method of claim 21, wherein the cation channel is
2 heteromultimeric.

1 34. The method of claim 21, wherein the polypeptide has an amino
2 acid sequence of SEQ ID NO:1.

1 35. A method for identifying a compound that increases or decreases
2 ion flux through a cyclic nucleotide-gated cation channel comprising a CNG2B
3 polypeptide, the method comprising the steps of:

(i) entering into a computer system an amino acid sequence of at least 100 amino acids of a CNG2B polypeptide or at least 300 nucleotides of a nucleic acid encoding the CNG2B polypeptide, the CNG2B polypeptide comprising an amino acid sequence at least 89% identical to SEQ ID NO:1;

8 (ii) generating a three-dimensional structure of the polypeptide encoded by
9 the amino acid sequence;

10 / (iii) generating a three-dimensional structure of the compound; and

(iv) comparing the three-dimensional structures of the polypeptide and the compound to determine whether or not the compound binds to the polypeptide.

1 36. A method of modulating ion flux through a CNG cation channel
 2 comprising a CNG2B subunit to treat a disease in a subject, the method comprising the
 3 step of administering to the subject a therapeutically effective amount of a compound
 4 identified using the method of claim 21 or 35.

1 37. A method of detecting the presence of CNG2B in human tissue, the
 2 method comprising the steps of:
 3 (i) isolating a biological sample;
 4 (ii) contacting the biological sample with a CNG2B-specific
 5 reagent that selectively associates with CNG2B; and,
 6 (iii) detecting the level of CNG2B-specific reagent that selectively
 7 associates with the sample.

1 38. The method of claim 37, wherein the CNG2B-specific reagent is
 2 selected from the group consisting of: CNG2B-specific antibodies, CNG2B-specific
 3 oligonucleotide primers, and CNG2B-nucleic acid probes.

1 39. In a computer system, a method of screening for mutations of a
 2 human CNG2B gene, the method comprising the steps of:
 3 (i) entering into the computer a first nucleic acid sequence
 4 encoding a CNG2B polypeptide having a nucleotide sequence of SEQ ID NO:2 or SEQ
 5 ID NO:3, and conservatively modified versions thereof;
 6 (ii) comparing the first nucleic acid sequence with a second nucleic
 7 acid sequence having substantial identity to the first nucleic acid sequence; and
 8 (iii) identifying nucleotide differences between the first and second
 9 nucleic acid sequences.

10 40. The method of claim 39, wherein the second nucleic acid sequence
 is associated with a disease state.

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